A MULTISTATE LIFE TABLE MODEL INCLUDING DISEASE RECOVERY FOR ASSESSING THE HEALTH IMPACTS OF CHRONIC ENVIRONMENTAL EXPOSURES

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Background and Aims: Multistate life tables, which model the movement of individuals within a population over time between various health states, provide benefits over standard life tables since they account for the many chronic health conditions associated with environmental exposures. However, these models have not previously included disease recovery. This is an important omission for certain conditions, such as asthma, from which people may recover during their lifetime. As such, this work aims to develop and apply a tool capable of including disease recovery for use in environmental risk assessment.

Methods: We present details of a new multistate life table model. The starting point for the method is age- and disease-specific mortality, disease prevalence and incidence rates. Individuals within the population may move between good health, several disease states, a recovered state and, ultimately, death. Time spent with disease is weighted for reduced quality-of-life. The model estimates quality-adjusted life expectancy (QALE) and can be used to study patterns of mortality and morbidity over time in response to changes in environmental exposures.

Results: We describe illustrative examples of the application of the model for health impact assessments of housing interventions in England and Wales. In particular, we show that a relatively modest decrease (3 µg m^{-3}) in average indoor PM$_{2.5}$ exposure results in an increase in QALE at birth of around two months, with ~600 fewer new diagnoses of asthma in children under 15 and ~3,000 fewer new cases of coronary heart disease per year.

Conclusions: The new model provides substantial benefits for performing environmental health impact assessments. Including disease recovery is an important step towards modelling the effects on population health of complex actions and interventions in a comprehensive manner. The model will provide useful information for policy-makers, helping them to more effectively determine the health impacts of environmental policies.